

# Educating heart and mind: Vincenzo Antinori and scientific culture in Nineteenth century Florence

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## ABSTRACT

*The paper aims to illustrate the scientific and cultural context in which Carlo Matteucci operated. The Imperial and Royal Museum of Physics and Natural History in Florence, opened in 1775, was at center of the research and teaching aimed at the dissemination of the then current scientific knowledge. The paper wants to illustrate the role of Vincenzo Antinori, Director of the Museum from 1829, in emphasizing the view of a public-minded science. And we want to recall the flourishing of sciences in Florence between the first and the second half of the 19th century.*

### **Key words**

*Scientific collections • Scientific instruments • Imperial and Royal Museum of Physics and Natural History • Educational activity*

Understanding the scientific culture in Nineteenth century Florence and particularly the role of the Imperial and Royal Museum of Physics and Natural History allows for a better comprehension of the historical context in which Carlo Matteucci (1811-1868), one of the latest directors of the Museum, operated. This Florentine institution was at the centre of the research and teaching aimed at the dissemination of the then current scientific knowledge. Here we aim to illustrate the various stages through which the Florentine Museum passed in the Nineteenth century in order to show the scientific vitality of the Tuscan Grand Duchy and to highlight the research, the studies, and activities developed there. These activities, debates, publications and lectures constituted the scientific and cultural background not only of Florence but all of Tuscany. They show a significant fertility and relevance not always

acknowledged by general historians or even historians of science. To know something of the evolving strands of research behind such a prominent figure as Matteucci then, it is important to observe the scientific paths and the cultural contexts that preceded him and particularly the endeavour of Vincenzo Antinori (1792-1865), who was for a long time the director of the Museum in Matteucci's epoch.

When, in 1829, Antinori became director of the Museum of Physics and Natural History in Florence the Museum had had more than 50 years of life. Founded by Grand Duke Pietro Leopoldo of Lorraine (1747-1792), and opened in 1775 under the direction of Felice Fontana (1730-1805), the Museum had become a reference point for specialists and scholars and had attracted illustrious visitors and amateurs (Contardi, 2002; *Nuncius*, 2006; Barsanti and Chelazzi, 2009; Raffaelli, 2009).

Rich both in collections of instruments, either constructed inside the Museum or acquired abroad, and in natural specimens from foreign countries, the Museum also had a huge collection of wax anatomical models constructed in its workshop. In addition, of course, it was devoted to the preservation of the scientific patrimony previously collected by the Medici Grand Dukes from the 16th century through the end of the Medici line in the mid 18th century. Unfortunately, after the succeeding Grand Duke, Pietro Leopoldo, left Tuscany in 1790 to become Holy Roman Emperor, and following an interval of the French dominance and political and social difficulties during the Napoleonic years, the Museum was for a while less active and known.

Thus when Vincenzo Antinori was named Director of the Museum in 1829, the institution needed an impulse towards a new development in order to confront the changes of the new century. A brilliant scholar of Physics and Mathematics, and a passionate populariser of the work of Galileo, Antinori was in close contact with the leaders of the Tuscan moderates. He was a figure of particular interest in the scientific context in Tuscany and his appointment was quite significant. In fact, Antinori had attended scientific courses set up at the Museum in 1807 and, as a student of Giovanni Babbini (1775-1819), he had distinguished himself as one of the best students in mathematics and experimental physics. So he was the first director from within the museum (Funaro, 2001; Contardi, 2009; Ciardi, 2010). Antinori's intellectual world included close relationships with Giovan Pietro Vieusseux (1779-1863), Gino Capponi (1792-1876), and the journal *L'Antologia* which was significantly open to scientific knowledge.

The then new Grand Duke, Leopoldo II (1797-1870), together with the group of intellectuals living in Florence, favoured this program. Among these persons were: Gian Pietro Vieusseux, who had founded the *Gabinetto Scientifico e Letterario* in 1820 and, on the next year, the journal *L'Antologia* (1821-1831) in which scientists, humanists, historians and others published their essays; and Cosimo Ridolfi (1794-1865), who founded in 1829 the *Cassa di Risparmio*, a savings bank for the poor, and a school in his Villa of Meleto to prepare agricultural workers. He also directed the very important *Accademia dei Georgofili*, founded in 1753 for the modernizing of agricultural studies.

Other important names and institutions in these same years of the 19th century were the *Osservatorio Ximeniano*, founded in 1756 by the Jesuit Leonardo Ximenes (1716-1786), subsequently directed by the Padri Scolopi, among them Giovanni Inghirami (1779-1851), astronomer and cartographer, who published in 1830 the *Carta topografica e geometrica della Toscana*, a very important and modern map of Tuscany (Miniati, 2009).

Among the people who arrived in this Florence of science was the physicist Leopoldo Nobili (1784-1835). Nobili had invented new and innovative magnetic instruments which allowed a great improvement in the studies of electromagnetism. Also living in Florence at the time was the astronomer and optician Giovan Battista Amici (1786-1863). He constructed microscopes and lenses and created a mechanical laboratory which later became the Florentine producer of precision instruments, the *Officine Galileo*.

Antinori obviously realized that he wanted talented scientists like Nobili and Amici to be associated with the Museum and, among other things, he urged the Florentine Court to back the creation of courses and lessons in order to increase the Museum's didactic activities. His request was successful, and in 1833 three chairs were created for as many teachers: Physics to Leopoldo Nobili; Comparative Anatomy and Zoology to Gaspero Mazzi (1787-1867), Mineralogy and Geology to Filippo Nesti (1780-1849). To improve the collections, these teachers also were urged to suggest the purchase new and/or obsolete instruments.

The courses were inaugurated on May 1, 1833. In his opening speech, the Director recalled the substantial continuity between the previous "immortal Leopold" and "the second Leopold". The first had prepared "the wonderful collections of natural products and apparatus of Tuscan experimental philosophy", while the second "had expanded and effectively enriched to the present day" the same collections (*Antinori 16*).

Antinori emphasized the importance of the Museum and declared that its cultural heritage had to be available "to all subjects". He hoped that this heritage would form "the mind, the intellect, the heart of young people" (*Antinori 16*). He endorsed the idea of a pedagogy capable of affecting the heart and mind of the pupils. Education should not be a sterile

academic exercise, but the training of the human capacities of people. In this perspective, natural sciences had a pivotal and no longer negligible role.

Antinori defined the physical disciplines as “very useful to man, because they educate both minds, heart and body of human beings”. And he emphasized the educational value of science: thanks to it, young people become able “to grasp the relationships between different phenomena, to develop the spirit of observation and to commit themselves to a search of social profit” (*Antinori 16*). The idea of the social utility of science was usually connected with the belief that science requires a collaborative attitude.

As scientist and director of the Museum, Antinori chose a behaviour coherent with his view of a public-minded science. He reorganized the galleries in the Museum of Physics: the objects were scientifically and historically arranged, according to his idea of an educational institution.

At the same time, he was convinced that scientific culture should take priority over literary and humanistic culture. This opinion was widely shared by Florentine intellectuals in these years: the journal *L'Antologia* often published papers by Antinori and others on scientific subjects (Miniati, 1985).

Particularly interesting is the criterion proposed by Antinori in order to display the collections of scientific instruments and machines to visitors. His policy followed a precisely historical order: scientific instruments and machines should be arranged according to the historical periods in which those scientific theories were discovered. The historical order does not concern the date of the manufacture of instruments, because Antinori was not interested in the history of the collection. Rather, he resorted to instruments in order to illustrate the most relevant discoveries in the field of physics, and the development of the discipline. This was a very important point. According to Antinori, the history of science is the history of the discipline. Following the path created by the Florentine scientist, the visitors of the scientific museum must be enabled to grasp the several phases of physics. They can learn step by step the development of a science inasmuch as they become aware of the instruments employed in it. The concrete arrangement of scientific instruments in the Museum must be a mirror of the historical and conceptual path of the discipline, and the visitors can understand the progress of physics and its dis-

coveries because they are chronologically and consecutively displayed. Obviously, the underpinning conviction was Antinori's idea of the history of science: the idea of a progressive, continuous increase of knowledge, conducive to a full disclosure of the secrets of the natural world (*Antinori 15*).

In the twenties the Museum was already rich in physics instruments; these amounted to over 900 items: scales and thermometers, barometers and pneumatic machines, instruments for experiments on electricity, telescopes and microscopes and other optical devices. There were also the very precious instruments coming from the Medici collections: astrolabes and quadrants, sectors and dividers, the Galileo relics and the glass objects of the Accademia del Cimento. The collection is now preserved at the Museo Galileo-Istituto e Museo di Storia della Scienza in Florence (Miniati, 1991; Camerota, 2010).

The astronomical observatory, constructed in the 18th century and completed in 1784, had important clocks and telescopes (Miniati, 1984). And also the natural history collections were rich and important: as Fausto Barbagli writes, they were oriented toward the naturalistic analysis of Tuscany, and this analysis put the theoretical knowledge to good use via exploitation of the natural resources of the territory (Barbagli, 2009a).

Antinori tried to improve the collections, both physical and natural. Under the impulse of the Grand Duke Leopoldo II, new exploratory travels were promoted and new interesting specimens were collected. Modern machines were acquired for the Cabinet of Physics, above all thanks to the Physicist Leopoldo Nobili and to the astronomer and optician Giovan Battista Amici.

Nobili was already famous for his studies of electromagnetism and was well known to Antinori before becoming established in Florence (*L'eredità scientifica*, 1984; *Leopoldo Nobili*, 1985). Antinori had bought an instrument invented by Nobili, a galvanometer, for the museum, and displayed it on the occasion of a visit by the latter to Florence in 1830. The year after this Nobili was involved in the riots in Reggio Emilia, was exiled to Marseille and then to Paris, finally settling in Tuscany. Nobili became closely connected with Gian Pietro Vieussieux, and Antinori obtained his appointment as professor of Physics at the Museum, where the scientist worked actively and promoted experimental researches.

Amici from Modena was called in the same 1831 to be astronomer at the Florentine Specola, the observatory tower in which the famous Jean Louis Pons (1761-1831) had worked until his death (Tarozzi, 1988; Meschiari, 2005). Amici and Antinori tried to create a new and modern observatory, an efficient structure, in another location; the new street lighting in Florence was creating light pollution and the Specola was no longer appropriate for night-time observations. They proposed the Forte di Belvedere as a new site, but the project was not accepted. The name of Galileo was also used to try to convince the Grand Duke but without success. The founder of Astronomy, Galileo, should have been glorified by the restorer of a modern astronomy, Amici.

Amici worked for the museum, constructed telescopes and lenses, very precise and successful microscopes, and worked with the wax modeller Luigi Calamai (1800-1851) to realize wax botanical models of specimens observed with his microscopes (Nepi, 2009).

The name of Galileo was often recalled in the years of Antinori direction. He, together with Amici, Ridolfi, and others, promoted the Meetings of Italian Scientists similar to those, as Barbagli says, of the national congresses held for several years in various northern European states. The idea for this kind of meeting came from the Prince Carlo Luciano Bonaparte (1803-1857), who “recognized the Grand Duchy of Tuscany as the most suitable place to host such an event, aware of the personal scientific interests of the enlightened ruler, who had been conferred the title of Member of the Royal Academy of London” (Barbagli, 2009b: 60). The first Meeting was in Pisa in 1839, the third in Florence in 1841. For this third, the Tribune of Galileo was erected inside the Museum of Physics, as a temple to the memory of Galileo and his discoveries (Barbagli, 2009c). Antinori conceived the iconographic project while the architect Giuseppe Martelli (1792-1876) was entrusted to realize the architectural project. This temple was provided with frescoed lunettes showing various moments of the scientific activity of Galileo, of the Accademia del Cimento and, in general, of the scientific research from Leonardo da Vinci to Alessandro Volta. Various stuccos and bas-reliefs portray astronomical discoveries and scientific instruments, while medallions offer portraits of important persons in sciences and their developments.

The scientists gathered in Florence for the meeting arrived at the Tribune after the official opening in the Salone dei Cinquecento of the Palazzo Vecchio. Cosimo Ridolfi, as President of the Congress, and the participants reached the Museum passing through the Corridoio Vasariano from the Palazzo Vecchio to the Palazzo Pitti and on through the new extension, a corridoio constructed by Pasquale Poccianti (1774-1858) a few years before the meeting in order to extend the Vasariano to the Museum of Physics.

Everyone admired the Tribune, in which instruments from Galileo and from the Accademia del Cimento were on show in special display cases. Astrolabes and general Renaissance instruments from the Medicean collection were also there, and the imposing statue of Galileo made by the sculptor Aristodemo Costoli (1803-1871) was at the end of the Tribune. In some rooms around the Tribune Antinori placed the old Physics cabinet. The great importance of the Museum of Physics in the years of Antinori is also demonstrated by the creation of the Central Italian Meteorological Observatory and of the Central Italian Herbarium (Barbagli, 2009b). The first was promoted by Antinori himself in 1839, at the Meeting in Pisa. The *Stazione Meteorologica* worked actively until 1858 when the Meteorological Archive was published. The Central Italian Herbarium was founded in 1842 by the botanist Filippo Parlatore (1816-1877). It was rich in specimens from all the world, but above all from Italy, thanks to a network with many herbals. Today it is still preserved in the Florentine Museum of Natural History.

The flourishing of sciences in Florence in these years is evident not only in the Museum directed by Antinori, but also in other institutions. For instance, we must recall the Accademia dei Georgofili, deeply interested in the agricultural college founded, as mentioned above, by Cosimo Ridolfi in Meleto, and in the promoting of the Tuscan Society of Horticulture, founded in 1852. And at the Accademia dei Georgofili Eugenio Barsanti (1821-1864) and Felice Matteucci (1808-1887) presented in 1853 their study of the new combustion engine (Borchi et al., 2005).

Vincenzo Antinori resigned in 1860. The post of Director went to Cosimo Ridolfi who, in turn, died in 1865. Filippo Parlatore then became temporary

Director. At the end of the same year Carlo Matteucci was appointed to the post. At that time the Museum was already connected with the new, university level *Istituto di Studi Pratici e di Perfezionamento*, born in Florence in 1861 (Ciardi, 2010: 140-146). He was in charge only three years. When he died in July, 1868, Filippo Parlatore succeeded him.

A few months earlier, in May, Matteucci wrote a letter to Stanislao Cannizzaro (1826-1910) about the Museum of Physics and Natural History of Florence, and we should like to conclude by quoting his words. Matteucci answered the question: why did he want to found a school for higher studies in Florence and especially in the Museum? Because, wrote Matteucci, “we must have respect for those memories...; because in this museum Fontana, Fabbroni, Amici, Nobili, Antinori and others more or less famous worked, and they made wonderful discoveries; because...the museum preserves the telescope with which the most important astronomical discoveries were made, and preserves the first thermometers, the apparatus of the Accademia del Cimento, and also the finger of the founder of the experimental method; because in Italy it is impossible to find another institution from which so many scientific studies have been come out” (Matteucci, 1868).

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